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THE ROLE OF ANIMAL AGRICULTURE IN BIODIVERSITY LOSS

Focus on meat and dairy production in the food sector

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International Business
Bachelor's Thesis
Supervisor: Pasi Rikkonen
Date of approval: 9 April 2021

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ABSTRACT OF
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Objectives
The main objectives of this study were to investigate businesses' attitudes on making and achieving biodiversity commitments, to better understand their responsibilities in preventing biodiversity loss, as well as draw attention to businesses' role and responsibilities on biodiversity loss, and their responsibility to be accountable for the consequences their operations cause.

Summary
The research aimed at investigating livestock farmers', and meat and dairy processors' role in biodiversity loss. The global context was studied through literature review from multiple perspectives: biological harm and benefits, policies regarding biodiversity, and CSR commitments. Finnish corporate attitudes were further explored by semi-structured interviews.

Conclusions
The role and responsibilities of livestock farmers and companies processing animal-based products remain unclear regarding biodiversity loss. The abstractness of biodiversity loss commitments makes them hard to understand and measure, which further poses challenges in establishing concrete action. Although the interviewees generally thought that the biodiversity is important and relevant issue, attitudes towards it were identified as a problem.

Key words: biodiversity, biodiversity loss, animal agriculture, corporate responsibility, dairy industry, meat industry, food industry

Language: English

Grade:

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1. INTRODUCTION

1.1. Background

Biodiversity i.e. biological diversity is defined as “the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part” by Convention on Biological Diversity (2006). Biology Dictionary (Knapp, 2020) further explains the three levels of biodiversity, namely genetic biodiversity, species diversity, and ecosystems diversity; genetic biodiversity is the genetic compositions of species – variation between different species and within the same species, species diversity refers to the richness i.e. number of species and the spread of the species, and on the other hand, ecosystems diversity relates to terrestrial, marine and aquatic ecosystems which have variety of subgroups. For example, grasslands, also utilized with ruminants in livestock farming, are a subgroup or terrestrial ecosystems, as well as rainforests that are destroyed in order to expand animal agriculture (Knapp, 2020).

Animal agriculture is one of the biggest global reasons for biodiversity loss, and it has enormous effects to the environment and climate as well, because raising livestock requires a lot of resources: water, feed, and land area (Chaudhary et al. 2016). In return, the energy conversion is relatively low. For example, Poore and Nemecek (2018: 990) found that even the “…lowest impact animal products exceed average impacts of substitute vegetable proteins” when assessing the environmental impacts of food products. From world’s land area, animal products (meat, aquaculture, eggs, and dairy) use about 87%. However, it only provides 18% of the calories, and 37% of proteins for human consumption (Poore & Nemecek, 2018). Hence, being very ineffective resource usage (ibid). Poore and Nemecek (2018) discusses in their paper, that consumers’ dietary choices can have ‘transformational potential’ for reducing environmental impact by excluding meat from the diet. Although producers can also influence their impact on environment by their practices, e.g. by conservation or organic farming methods, the impact is not as big, because these methods are not essentially solutions for the problem.

Biodiversity loss is often associated with species loss but it is a threat for the health of whole ecosystems changing their structures (Rafferty, 2019). It can be natural e.g. due to temporary natural disasters like floods, but biodiversity loss can be human-

driven, in which case it is also considered to be more severe and long-term, as opposed to short-term nature of natural biodiversity loss (ibid). Human-led activities can lead to changes in the animal species habitants, or reduction in the living environment and that way contribute to endangering species (FAO, 2020). International Union for Conservation of Nature's Red list of Threatened Species lists extinction risk statuses of different species: animal, fungus, and plants. To date, they have assessed about 134 000 species of which over 37 400 are threatened by extinction (IUCN, 2021). Animal agriculture is considered the number one reason for rainforest destruction, which are biodiversity hotspots as the species richness is among the highest in the areas with rainforest vegetation, and animal agriculture accelerates biodiversity loss through habitat change due to land conversion overall and agricultural intensification (Chaudhary et al. 2016).

However, the issue is not so simple because raising livestock can have also positive impacts on the environment. Especially, in organic production, grassland biodiversity benefits greatly from grazing (Allen and Hof, 2019). Additionally, in livestock farming, the farmers are dependent on the biodiversity as they so closely utilize natural resources, and without the ecosystem services utilized in the production, their systems cannot be sustained (FAO, 2019). Therefore, the livestock farmers, and all entities reliant on it, should realize the importance of taking care of the surrounding and on-site biodiversity. Farmland biodiversity can be referred to as agricultural biodiversity or agro-biodiversity. It is defined by Encyclopedia of Food Security and Sustainability (2019) as "the variety and variability of animals, plants and micro-organisms that are used directly or indirectly for food and agriculture, including crops, livestock, forestry and fisheries". Based on these definitions, biodiversity is a large concept. It is essential for human wellbeing, because it consists of our living environment – humans, domestic animals, wild animals, trees, soil, water, food. It is also essential for the food systems and therefore also for livestock farmers and businesses that utilize products from animal agriculture.

1.2. Research Problem

Between 1970 and 2014 vertebrate populations were reduced by estimated 60% (WWF, 2018 cited in Kashmanian, 2019) suggesting rapid loss of species. One of the reasons is identified to be agriculture, and livestock grazing takes up approximately 77% of the world's agricultural land (Rafferty, 2019). Due to land conversion, deforestation, and mass production, animal agriculture is the number one reason for biodiversity loss (Chaudhary et al. 2016), and because biodiversity is important for all life on Earth, including humans, species extinctions can have detrimental effects on life (FAO, 2020). Although biodiversity loss is often associated with species richness and hence, species loss or extinction, can biodiversity loss also reduce the overall health of ecosystems (Rafferty, 2019). Biodiversity additionally go hand in hand with other global crisis than biodiversity loss, including global warming and Covid-19 pandemic, as more versatile ecosystems are more resilient to change (Isbell et al. 2015). Although this is known, it remains unclear what can be done about it. Biodiversity can be considered as an abstract and broad term, which is hard and costly to measure by businesses (De Silva et al. 2019).

Because meat and dairy products are considered to have biggest negative consequences to biodiversity loss (Poore & Nemecek, 2018; Crenna et al. 2019), this research focuses on animal agriculture. The literature review aims to explore the overall global context of biodiversity impacts, and explore established attempts of biodiversity commitments, whereas the focus of empirical research is to discover the measures Finnish meat and dairy processors have done towards biodiversity and explore their attitudes towards biodiversity loss through qualitative interviews. The problem is very multifaceted and complex, and it has not a simple answer, as animal agriculture has both positive benefits and negative impacts on biodiversity. Therefore, this thesis aims to investigate corporate responsibility regarding biodiversity loss by exploring businesses' attitudes, and thoughts about the relationship of biodiversity loss and animal agriculture.

1.3. Research Questions

This research aims to answer the following questions:

(1) What is the role of animal agriculture as an industry on impacting the development of biodiversity?

(2) How should livestock farmers and animal-product processors take action to minimize or even reverse their contribution to biodiversity loss?

1.4. Research Objectives

The research objectives of this study are to:

- Investigate businesses' attitudes on making and achieving biodiversity related commitments, and their responsibilities in preventing any biodiversity loss.
- Draw attention to businesses' role and responsibilities on biodiversity loss, and their responsibility to be accountable for the consequences their operations cause.
- Provide suggestions for dealing with the ethical concerns of biodiversity loss.

1.5. Definitions

Biodiversity – Biodiversity or biological diversity means the spread and diversity of living organisms, including the diversity of genes, species, and all terrestrial and aquatic ecosystems (CBD, 2006; Knapp, 2020).

Biodiversity loss – Biodiversity is defined by Rafferty (2019) in the Britannica as the reduction in biodiversity (including genetic, species and ecosystems diversities) illustrating "…decline in the number, genetic variability, and variety of species, and the biological communities in a given area". The main drivers for human-led biodiversity loss are: habitat loss, invasive species, overexploitation, pollution, and climate change (Rafferty, 2019).

Agrobiodiversity – Agricultural biodiversity or agrobiodiversity means living organisms that live in ecosystems on farm, including plants, and animals that are sustained in farms e.g. crops, livestock, forestry and fisheries (Encyclopedia of Food Security and Sustainability, 2019).

Animal agriculture for food sector – Animal agriculture refers to animal husbandry or livestock farming where animals are grown in farms to produce food and other

commodities for humans. This paper focuses on food production, such as meat, and dairy. Typical animal agricultural farms producing animal-based products for food consumption include cattle farms (dairy cows and beef cattle), pig farms, sheep farms, chicken farms (eggs, broiler meat) (Miller, 2020).

1.6. Abbreviations

ABOS = agri-environmental biodiversity offset schemes
AES = agri-environmental schemes
BO = biodiversity offset
CBD = Convention on Biological Diversity
CON = concentric circles
CR = corporate responsibility
CSR = corporate social responsibility
EU = European Union
FAO = Food and Agriculture Organization
IC = intersecting circles
IUCN = International Union for Conserving Nature
LCA = life cycle assessment
LCIA = life cycle impact assessment
NNL = no net loss
NPI = net positive impact
PES = payments for environmental services
UN = United Nations
UN SDGs = United Nations Sustainable Development Goals
WWF = World Wildlife Fund

2. LITERATURE REVIEW

2.1. Introduction

Animal agriculture is a leading cause for biodiversity loss as identified by Chaudhary (2016), and FAO (2020), for example. That is why it is so important for the livestock sector to take action to minimize the harm and maximize the protection of biodiversity. Biodiversity is vital for animal agriculture because of on-farm biodiversity i.e. agro-biodiversity, and because of the ecosystem services it depends on such as pollinators (FAO, 2019). However, animal agriculture and its impacts vary within the field. Industrialized 'conventional' farming, that relies on monocultures, is more harmful for biodiversity than organic farming that promotes diversifying (Dayoub & Korpela, 2019; Knudsen et al. 2019). The action to prevent biodiversity loss in animal agriculture is driven by multiple disciplines, such as the business practice (CSR; corporate reporting), policies (legal and institutional/voluntary), and biology (impacts, measurement tools; suggested action). The studies repeatedly suggest that there is a lack of action in incorporating biodiversity commitments in corporate level (e.g. Smith et al. 2019; De silva et al. 2019).

Because biodiversity loss is so multifaceted problem, and because everyone are stakeholders of it – regardless of sector or location globally, the issue needs to be addressed from many perspectives. This literature review aims to highlight the multiple perspectives in understanding why action to protect biodiversity is limited in business, and particularly in animal agriculture. It identifies knowledge gaps specific to the industry as many of the relevant studies reviewed are not directly from animal agriculture, which poses further challenges for the applicability of those cases and their results.

2.2. Biodiversity impacts and benefits of animal agriculture

2.2.1. Impacts of animal agriculture on biodiversity

Biodiversity loss is a risk for the natural environment, and for all of its species, including humans. This way biodiversity loss poses a risk for also businesses, whereas business practices can, in turn, cause a risk for biodiversity. Most important global driver of biodiversity loss is habitat change (FAO, 2020), especially due to land

use in animal agriculture (Chaudhary et al. 2016). The main biodiversity impacts that animal agriculture has are that it destroys species habitats by expansion, deforestation, land conversion, and it produces greenhouse gas emissions (methane from ruminants, CO_2 from burning forests) (ibid). Main reasons behind the causes are that animal agriculture requires so much space, and the conversion ratios are high i.e. the animal feed required to produce a kilogram of meat is relatively high, and causes a lot of waste in the process as a lot of the energy is lost (Chaudhary et al. 2016). Hence, livestock farming poses variety of threats to biodiversity.

The impacts on biodiversity can vary depending on the product in question. Head et al. (2013) illustrate the differences between different products under same categories. They calculated both environmental and animal welfare impacts of animal and alternative product life cycles. They compared the results between and within categories. They found, for example, that beef and veal have higher average score, by over 13 times, than poultry. This they explain by key differences in production, such as “livestock management, feed, feed conversion and greenhouse gas production by ruminants” (Head et al. 2013: 172) The beef and veal product group had substantial differences even within the group. Brazilian beef, which was also the highest scoring product of them all, scored 70 times higher than the lowest scoring in the group – mince from dairy cows. Overall, the animal products ranked more harmful than the alternatives. Thus, some animal products are more harmful for biodiversity than others, e.g. Brazilian beef over meat from dairy cows.

Animal agriculture needs a lot of land for growing feed for the animals. Cattle and sheep produce methane from ruminating and require extensive shares of land for feed (high feed conversion ratio) and management (pasture, cages) as measured by Head et al. 2013. They calculated that chickens and turkeys have lower feed conversion ratio compared to pigs, meaning more efficient conversion of feed to meat, but due to higher consumption soy, their impact on biodiversity is bigger. Soy has considerable biodiversity impacts because it is mostly grown in deforested tropical rainforests that have high species richness (Head et al. 2013). Most of the soy grown in the world is used as feed for livestock, which means that a lot of it is wasted due to high conversion ratios. E.g. Chaudhary et al. (2016) found out that highest mammal species lost in the countries of origin were caused by cocoa, coffee

and soybean. Brazilian beef also has the implications from deforesting tropical rainforests as the cattle also use pastures that has been converted from the rainforests (Head et al. 2013). The feed used for raising the animals is one of the reasons behind deforestation and has remarkable effect on the total impact of the animal product on biodiversity.

Soy is among the crops that are mostly used for feed and that have the biggest impacts on the biodiversity, and species extinction. 160 crops were studied by Chaudhary et al. 2016, and at the time of the study, rice, maize and wheat occupied 40% of global agricultural land but they were still not the crops that had the biggest impact on biodiversity loss and species richness. Instead, coffee, rubber, tea, palm oil, and soybean were identified to occupy the biodiversity hotspots where various endemic and threatened species live, although together they used less than 10% of the agricultural land globally. Crenna et al. (2019) calculated that barley and soybean as feed represented the most contribution of meat products' biodiversity impacts. Additionally, Head et al. (2013) suggest that the biodiversity impacts of specific meat type substantially differ when more soy is consumed by the animals. There are many implications to this. First, soy is a crop that is mostly used as feed for agricultural animals. Secondly, because the soy is produced in areas with high species, the damage is more immense than with other crops.

Animal agriculture can pass pollution to the environment and that way cause damage to the habitats and biodiversity. Krief et al. (2017) studied the effect of agricultural expansion on wildlife in Kibale National Park, Uganda. They wanted to know what kind of impact the pollution released from tea plantations close to the park had on threatened species: chimpanzees and baboons. They found out that there is an alarming lack of transparency between the farmers, villagers and consumers, as the farmers did not record their use of chemicals and the treatment protocols. They identified this leading to unawareness among the villagers and consumers of the possible exposure to products that are potentially dangerous. The study by Krief et al. (2017) suggests that in the case of chimpanzees, the contamination of the individuals had happened through digesting pesticide contaminated plants, implying long-term damage in the ecosystems through food chain. However, as noted in their study, they cannot, based on the study and its results, deny the possibility of other

factors contributing to the dysplasia. Further, this study focused on a specific case, not related to animal agriculture specifically so the application of these effects to other contexts is limited. However, it shows the importance of transparency between farmers and their stakeholders, and importance of awareness of own contribution to the surrounding biodiversity. Although Krief et al. (2017) study has limited applicability, FAO (2020) points out the two types of pollution caused by livestock – nutrient pollution (fertilization) and ecotoxic pollution (pesticides, veterinary products, antibiotics, anthelmintics and hormones). Because nutrients are captured by animals inefficiently, urine and manure enter soils and surface water casing eutrophication according to the report. This suggest that there are pollutions in livestock farming that also can cause dramatic changes for the habitats and hence, to biodiversity.

Biodiversity hotspots, where the species richness is the highest, can be different depending on the species that are looked at. The biodiversity loss impacts are distributed unevenly in the global context as it hits worst in the so-called biodiversity hotspots where the species richness is the highest (Straussburg et al. 2012; Chaudbury et al. 2016). Strassburg et al. (2012: 3) identify following areas to have most severe destruction from deforestation: “western Amazon, the Congo basin, Southeast Asia and the Atlantic Forest of South America.” They suggest a carbon emission offset that would compensate the released emissions and therefore, reduce the burden on biodiversity through deforestation. Chaudhary et al. 2016 studied the damage on biodiversity caused by crop, pasture and forest land use. They identify hotspots for mammal species to be Indonesia, Madagascar, Philippines, Brazil, Papua New Guinea, China, India, DR Congo, and Mexico. Pasture was most damaging land type in Brazil, whereas agricultural land was the main driver in Philippines, India and Sri Lanka. Chaudhary et al. (2016: 3931) found that Madagascar, China, Brazil, Australia and Colombia together accounted for “45% of the total mammal species loss due to global pasture land”, compared to the area which is 28% of the total global pasture area. On the other hand, for birds, a hotspot in addition to the five mentioned is New Zealand, but for amphibians the hotpots were Colombia, Brazil, Ecuador, Peru, and Venezuala. These suggest that there are unique differences in the ecosystem that are regionally depended, and there are also regional implications for the urgency to take action towards biodiversity conservation and to do it in a way that benefits the most locally.

2.2.2. Benefits of animal agriculture on biodiversity

Animal agriculture can also benefit biodiversity. FAO (2020) reports that the changes in habitats caused by livestock farming can also benefit the biodiversity: “Grazing shapes grassland ecosystems and can increase plant species richness under adequate management” (FAO, 2020: 49). The report also suggest that the farms consist of variety of habitats (“soil, grass, fallow, shrubs, trees, wetlands”) and resources (“seeds, flowers”) that can sustain variety of species, increasing on-site biodiversity. The changes can be classified as protection, degradation and destruction, and the negative habitat changes are caused by land transitioning. Wildlife species are in close contact with the farms, and thus, farmlands can be considered to have a role as food resource or linkage between natural habitats (FAO, 2020). To be able to protect the species and their habitats, the farmers need to identify, map, and monitor the species in question (FAO, 2020). FAO (2020) further suggests that biodiversity action plan will help adopt practices protecting and promoting the wildlife. Benefits that animal agriculture with adequate monitoring has on biodiversity are ecosystem management, versatile on-farm habitats for species, and connection between natural ecosystems.

Thoughtful implementation of biodiversity conservation activities in farms can also benefit the biodiversity. Fragmentation worsens the negative impacts livestock causes for the habitats, because smaller patches sustain less species as reported by FAO (2020). They note, however, that “conversely, if patches of original habitat are large and in proximity to one another, connecting them with wildlife corridors provides a conservation opportunity” (FAO, 2020: 50), and this way allowing for the livestock farms to improve the biodiversity. The impact of animal agriculture on biodiversity is not black and white, because animal agriculture can potentially have also positive on impact. To what extent, and whether they can outweigh the negative needs to be investigated further, by measurement tools like LCA used by FAO (2020) and Crenna et al. (2019). It is therefore possible to counterbalance or work around some of the critical threats that farms pose on biodiversity.

2.2.3. Measurement tools for biodiversity impact and benefits

Life Cycle Assessment (LCA) is the most widely used measure of environmental impacts, and it can also be used to calculate damages on biodiversity. Crenna et al. (2019) investigated impacts of the food consumption in Europe on biodiversity using LCA. It is a tool to assess supply chains and their environmental impacts (ibid). With LCA, they compared 32 representative food products consumed in Europe. The products were selected based on previous literature (Notarnicola et al. 2017; Castellani et al. 2017) with updating the list, e.g. by relevance, and new trends. The results from Crenna et al.'s (2019) LCA measurements asses both environmental impacts and impacts on biodiversity, although the biodiversity focus is only on land use. They found that the highest impacts were found to be meat consumption, and "…other animal-based products (milk, cheese, butter and eggs)" (p. 383). When assessing impacts on biodiversity, they found out that "…same eight products contribute to more than 75% of total damage to biodiversity…" (p.384). Here, too, meat was the main driver for the total species loss. For beef and pork, it was due to natural land conversion (Crenna et al. 2019). The LCA method, therefore, can be used to calculate the biodiversity impacts of different processes in the value chain. The method is developed to assess life cycle environmental effects for research purposes, and later applied to measure for biodiversity related impacts as well.

LCA measurement can be modified to better suit its purposes. Head et al. 2013 used a special version of LCIA (life cycle impact assessment) because they aimed at developing an app for consumers to recognize the impacts of the products they shop for, and hence, wanted the calculations and results be easy to interpret by ordinary people. "A decision was made to extricate climate change impacts from both biodiversity and human health categories in order to present climate impacts separately in the app and to avoid double counting impacts" (Head et al. 2013: 173). Perhaps the use of measurements tools could have lower barrier if they would be easier to understand by the farmers and other businesses as well. It seems like the main use for the tool is in fact research, and hence, it might not be helpful for businesses, since likely many would not have the resources to allocate for that. Overall, there are tools to measure biodiversity impacts but whether they are accessible and applicable for farmers or other supply chain members would need to be examined more.

2.3. Differences between organic and conventional farming

Many benefits of livestock farming on biodiversity are associated with alternate methods to conventional, or intensive farming, e.g. organic farming systems. Organic farming considers and utilizes the natural environment in the farming processes. Dayoub and Korpela (2019: 527) define organic farming as “a production system that maintains soil fertility, ecosystems, and communities”. Thus, promoting biodiversity. They identify that organic farming utilizes crop rotation for soil fertility and avoids use of chemicals such us pesticides and herbicides. Further they identify that in organic livestock farming, antibiotics and synthetic growth hormones are forbidden. The animals are fed by organic feed and in general, animal welfare is a bigger concern than in conventional farming (Dayoub & Korpela, 2019). Further, Seufert and Ramankutty (2017) identify benefits for organic agriculture to be higher biodiversity (also identified by Dayoub & Korpela, 2019), soil quality, water quality, profitability, and nutritional value which come with the cost of lower yields and higher prices for consumers. Dayoub and Korpela (2019) suggest that the profitability is better for organic compared to conventional farming because of governmental allowances and higher market prices, although the yields are lower. These benefits and costs, as analysed by Seufert and Ramankutty (2017), however, depend on the context. Another question to be considered would be regarding the yields, and whether the need for more farmland area, due to lower yield, would be so significant, that the effects from habitat destruction would be greater. Still, organic methods generally seem to benefit the biodiversity, and has a lot of potential for sustainable farming and hence, seems very competent start to transform agricultural scene to slow down the trend of biodiversity loss.

In literature, organic and conventional farming are often compared and contrasted. Knudsen et al. (2019) compared conventional and organic milk and found that organic production has clearly lower negative impacts on biodiversity because the animals are fed on organic feed, and because the feed consists of higher ratios of grass. Their results even suggest that the organic methods might increase the on-farm biodiversity. Indeed, Allen and Hof (2019) discuss that livestock grazing enhances the grassland ecosystems. Treu et al. (2017) on the other hand, compared

the impacts of conventional and organic diets on carbon footprints and land use. Biodiversity was not considered in their study, but especially land use threatens biodiversity as habitat destruction is one of the leading causes for species extinction (Crenna et al. 2019; Rafferty, 2019). Treu et al. (2017) found that the carbon footprint was equal in conventional and organic diets and the land use was higher for organic farming. The diets itself had significant differences; more meat, which is carbon intensive, was consumed in conventional diet. Whilst organic farming has positive biodiversity effects, Treu et al.'s (2017) study suggests that some aspects of it might cause more environment burden than conventional methods. However, the study (Treu et al. 2017) and Röös et al. (2018), suggest that organic diets promote significant reduction in meat consumption, implying that the diet overall is more biodiversity-friendly. The study also acknowledges that the previous literature has extensively found that organic farming outperforms conventional when looking at biodiversity impacts and benefits. Organic and conventional farming do not only differ in regards of the farming practices, but also the attitudes that consumers and even farmers have as suggested by the dietary changes and differences in feed and grass proportions.

Trying to mimic conventional farming to compensate for the low yields associated with organic methods can be destructive for the industry. Dantsis et al. (2009) and Röös et al. (2021) both discuss that sustainable agriculture is more than the environmental effects, and suggest transformation in agricultural practices beyond organic farming. Dantsi et al. (2009) especially addresses the danger of shifting organic farming methods towards conventional ones referring to the phenomenon as 'conventionalization'. The idea of mimicking conventional farming methods is also highly criticised by Röös et al. (2018). They studied increasing yields in organic farming and contrasted and compared the associated risks and opportunities. They argue that increasing yields in organic farming might reduce the positive effects of it if measures to compensate for the consequences of increasing yields is not acted upon. According to them, only following EU regulations is not enough for counteracting the negative impacts. Röös et al. (2018) argue for promoting more animal friendly organic livestock systems although they would be lower yielding, because it is natural for a system that considers environment and animal well-being more extensively. Allen and Hof (2019) highlight that intensive farming does not

provide biodiversity benefits; thus, the ecological loss needs to be compensated. They suggest that livestock farming should be encouraged to shift towards less intensive practices by alternative farming systems and ecological compensation policies. In the long-term, sustainable agriculture should mean going beyond organic farming instead of altering the organic systems to resemble conventional methods.

2.4. Established ways to protect biodiversity

One way to approach preventing biodiversity loss, could be offsetting the damage caused. There are already established concepts for compensating the biodiversity damage. These include Biodiversity Offsets (BO) and Agri-environmental Biodiversity Offset Schemes (ABOS). The study by Vaissiere et al. (2020: 2) proposes that the definition of Biodiversity Offsets (BO) is "(1) the supply of an ecological gain (2) in response to an ecological loss (3) located in a compensation site distinct from the impacted site (4) following agreed-upon criteria for the equivalence between gains and losses". This definition, according to them, includes both regulatory and voluntary offsets, but excludes compensation that is only financial, implying that action benefiting the biodiversity is required. Further the study highlights that Biodiversity Offsets have substantial differences to Payments for Environmental Services (PES) mainly through the fact that the nature of PES makes it voluntary for both parties which hardly ever applies to BO. ABOS are similar to BO. Calver et al. (2019) studied the effectiveness of ABOS, agri-environmental biodiversity offsets schemes, in delivering biodiversity gains. These ABOS they define as contracts between a developer, e.g. construction of a new railway line, and farmers. The farmers would, for financial compensation, change their practices so that the biodiversity impact from the developer's project would be offset. Hence, these biodiversity offsets are not something that the farmers commit to in order to mitigate their own externalities. Instead, they are programs where the farmers do extra work with financial benefits to compensate another actor's biodiversity damage. Calvet et al. (2019) even found that most of the farmers were not willing to maintain biodiversity-friendly practices in the absence of financial support although their attitude to renew the contract would be favourable.

Motivating factors in participating in the offset programs are monetary and reputational. Le Coent et al. (2017) compared biodiversity offsets (ABOS) with biodiversity conservation programs (AES) and found that farmers favoured conservation programs over offset programs. They found that higher payments were needed to involve the farmers in biodiversity offsets. This also implies the financial interest in the participation of these kind of schemes. As opposed, the farmers receive altruistic utility gain from the conservation contracts because they are perceived by them “as a contribution to the biodiversity public good” and hence, they seem more favourable (Le Cent et al. 2017: 127). Le Cent et al. (2017) hypothesized that behavioural drivers would cause the farmers to prefer AES over ABOS as conservation contributes to improvements whereas offsets just repair the damage. Indeed, there is a difference in the connotation of the two words, which can have the implied, positive or negative, meaning in the minds of the farmers. Biodiversity offsets that were rejected by farmers involve direct responsibility for the environmental damage as they are intended to compensate the same loss (Le Cent et al. 2017), so the study’s results could be interpreted to suggest that farmers dislike biodiversity offsets because that would mean that they need to take responsibility which is reciprocated with refusal. In addition to financial and reputational benefits, farmers attitude affects the willingness to take part in BO programs.

In biodiversity offset programs, the farmers get financial support for changing their practices to meet the sustainable requirements needed to compensate the biodiversity loss caused by the developer in the contract (Le Coent et al. 2017; Calvet et al. 2019; Vaissieare et al. 2020). These programs, however, are not designed for farmers to take responsibility over the biodiversity loss caused by their operations or to prevent biodiversity loss by conservation because of the damage their operations are doing. Unlike carbon emission offsets or flight compensations, they are not as yet more than a mere allurement to move responsibility from one operant to another (ibid). Straussburg et al. (2012: 1) simulated carbon-based offset for forest conservation and found that it could have a key role in biodiversity conservation “if well designed, adequately funded and broadly implemented”. The application of the biodiversity offset programs is limited, as more research would be needed to investigate the effectiveness. Regardless, the existing Biodiversity Offsets are not adequate in their essence because they are not solving the root causes.

2.5. Corporate responsibility in animal agriculture

Corporate social responsibility (CSR) and corporate responsibility (CR) both suggests that businesses only interest should not be profitability, but that they have other responsibilities in the society as well. The main components in many CSR models are economic, legal, ethical, and philanthropic. One of the common models is The Pyramid of CSR developed by Carroll in 1991. It illustrates CSR in a form of a pyramid, that has economic level foundation, and which narrows toward the top with three other levels in respective order: legal, ethical, and philanthropic. De Olde and Valentinov (2019) reviews moral complexity surrounding agriculture by evaluating two conceptual frameworks: a Luhmannian Systems Theory Framework and Carroll's well-known CSR Pyramid. In the article, they discuss the controversies that make the ethical judgement in agriculture so complex. They suggest that CSR initiatives within the agricultural sector are challenging, because ethical and moral stands vary, and are highly debated, which makes it hard to achieve consensus within the sector. They describe moral complexity being a challenge for CSR in animal agriculture because there is no common understanding about what would be considered ethical, e.g. when debating animal welfare. Further, the development of initiatives addressing ethical and philanthropic activities is a challenge, because of challenges posed by choosing the focal issue, finding sophisticated measurement indicators, and evaluation of good and bad levels of performance (De Olde & Valentinov, 2019). Moral complexity makes the judgement of CSR in animal agriculture complicated.

Lack of consensus of ethical approach in animal agriculture poses challenges for implementing suitable practices. De Olde and Valentinov (2019) explain why there's a failure to meet societal concerns in animal agriculture – one reason being that when looking at Carroll's CSR Pyramid, instead of considering ethical and philanthropic perspectives as expected and desired, in agriculture, they are seen 'hotly debated'. Although their study takes into considerations the pressure between agriculture and its societal impact, it remains general and descriptive. They still offer understanding of why the controversy in CSR in the agriculture exists. However, the focus of their examples are more on animal welfare in the farms, whereas the focus of this paper is on biodiversity loss caused by the farms. Gold and Heikkinen (2013)

alternatively consider failure to apply strategic corporate responsibility in the food supply chain. They point out several reasons for confusion in defining CR actions such as failure to recognize context-dependency and the conceptual differences of responsibility and accountability. They suggest that different actors in a supply chain, primary producers, processors, retailers and consumers, have different CR challenges. This further complicates the roles and responsibilities each actor has or should have. Unclearness of central concepts in CR and CSR can be a barrier for action in animal agriculture.

On the other hand, the Pyramid of CSR limits the understanding and applicability of the role of corporate social responsibility. Geva (2018) analyses implications and limitations of three CSR models, including the Pyramid of CSR, but also Intersecting Circles (IC) and Concentric Circles (CON). The article compares the three models in a theoretical approach also addressing implications relating to research and application of the models in practice. The author heavily criticises the applicability of the Pyramid of CSR for its hierarchical order of importance that narrows the understanding of CSR. In the study, it is described that the pyramid only considers philanthropic activities as “icing on the cake” (Geva, 2018: 6). While IC illustrates order of responsibilities non-hierarchically, with intersecting circles, as in its name, it still fails to see philanthropy as an integral part of CSR. Geva (2018: 34) argues: “…Unless we are willing to acknowledge that all corporate social responsibilities share a common normative essence, there is little prospect of finding a way out of the difficulties inherent in disintegrated frameworks such as the CSR pyramid and the IC model”. Although shifting towards Concentric Circles takes a normative approach and centres around the idea of social betterment as “an incurred obligation” for businesses (Geva, 2018: 24), there are limitations. As acknowledges by Geva (2018), CON model does not really have a tool to measure it, and certainly the Pyramid of CSR model measurement tools cannot be applied to CON due to the substantial differences between the models. The CSR Pyramid has its limitations but since it quite clearly captures the current attitude towards corporate social responsibility, as implied by Geva (2018), the use of the CSR Pyramid is used as a reference point to compare how animal agriculture as an industry performs in that aspect.

Corporate responsibility (CR) can possibly be a strategic advantage if it is utilized in company's strategic planning. Heikkurinen and Forsman-Hugg (2011) studied strategic corporate responsibility and its application in the food chain. They suggest that competitiveness can be increased by strategic CR combination which they identified as (1) beyond-responsive & holistic, (2) beyond responsive & arrowhead, (3) responsive & holistic, and (4) responsive & arrowhead. They look at CR from unresponsive, responsive, and beyond-responsive perspectives with hierarchical and increasing emphasis on competitive advantage. This approach implies strong connection between CR and strategy, and they suggest that strategic CR can potentially lead to higher profitability and clear competitive advantage. Hence, proper application of CR can lead companies to improve their performance in comparison to their past performance and the competitors.

Environmental dimension, including biodiversity related issues, is crucial part of corporate responsibility. Heikkurinen and Forsman-Hugg (2011) and Gold and Heikkurinen (2013) look at the corporate responsibility from economic, environmental, and socio-cultural perspectives, which are also the core elements of sustainability. All the dimensions of sustainability (economic, socio-cultural and environmental), as explored by Gold and Heikkinen (2013), are interconnected, but they are not all interdependent. They argue that economic and socio-cultural dimensions are dependent on environmental, but not vice versa, because natural environment is independent of human-made systems in economic and socio-cultural dimensions. Therefore, the authors suggest all three to be considered equally in strategies for CR. Because all the dimensions are important, the focus should be in all of them.

2.6. Biodiversity commitment reporting by companies

Corporate reporting is a way for businesses to communicate with their stakeholders about their activities, including their biodiversity related commitments. However, they also show the lack of action done to prevent biodiversity loss or committing to the measures. Smith et al. (2019: 8) found in their study that there is a need for clearer roles and responsibilities for businesses to achieve international targets, such as CBD's (Convention on Biological Diversity) Aichi targets, and that it would be a start

in “fundamental system-level change required to reverse biodiversity loss”. This implies that there is more work to do to better hold businesses accountable and have them meet the goals more effectively. ‘Fundamental systems-levels’ also suggest that the change should happen in a large scale.

Corporate reporting, because its public, can be limited to information the company wants its stakeholders, and the public, to know. Throughout the cases studied by Smith et al. (2019: 7), a common theme was lack of detail on “business’ accounting for interdependencies with biodiversity”, although the information available was found to vary in a great degree. To note, their case analysis relied on publicly available information meaning that they might not have had all information on hand. However, it seems unlikely that companies would want to hinder key information, especially information that could possibly foster their reputation. From the information available, since it often missed “…precise activities, quantitative indicators, baseline calculations, longitudinal data or indeed any quantifiable biodiversity outcome information…” (Smith et al. 2019: 7), there was no way for the researchers to measure if the gains through biodiversity related business actions exceeded the impacts, and this is what remains a problem in understanding business role and actions in biodiversity conservation. Smith et al. (2019: 7) suggest that the issues in business accountability “…must be overcome for business to make their contributions to international biodiversity commitments clear”. One critical issue in corporate reporting is the validity of it, and when considering actions of sustainability and environment-friendliness, greenwashing can become a problem, as identified by Smith et al. (2018). Since actions taken are very inadequate, suspecting greenwashing seems slightly irrelevant, although it could become problematic in the future when biodiversity concern is more mainstream. Overall, the lack of commitment might suggest lack of concern.

Corporate reporting gives insights of the values, perceptions and actions companies have towards biodiversity. Smith et al. (2018) studied the reliability of corporate reporting regarding biodiversity in forestry and salmon fishing in Chile. The operational impacts on biodiversity within the two sectors were different, implying different approaches to reporting and conservation, but regulatory contexts and form of stakeholder engagement also influence the actions of the businesses (Smith et al.

2018). Like Smith et al. (2019), also Smith et al. (2018) highlighted the failure to leverage change. They, however, valued the ability of corporate reporting to provide insights about the perceptions and actions of companies towards biodiversity loss and its importance. This is valuable for research, and for the future, as it points out the lack of attention given to crucial global problems, like biodiversity loss. As much as Smith et al. (2018) studies the differences of the biodiversity related corporate reporting and action, the study is not focused on animal agriculture. Some of the findings might be specific to the industries or to the context – Chile. A question that raises is whether it can be generalized outside the scope. Overall, different sectors can see biodiversity loss threat differently, as it might affect them differently.

Only very few in high biodiversity risk sectors commit to biodiversity protection. De Silva et al. (2019) highlights the absence of companies and their suppliers in food and beverage as they are in a high-risk sector in their study where they had identified all companies making biodiversity commitments between 2001 and 2016. Only Barry Callebaut and Pukka Herbs had any biodiversity commitments. De Silva et al (2019) explains the lack of corporate commitment for biodiversity through challenges that are posed. For example, they state that in general, businesses do not consider biodiversity as a material risk, like they do deforestation (zero deforestation targets) and carbon emissions (zero carbon emissions targets), and they consider that it is difficult to measure the effects of biodiversity conservation compared to the two previously mentioned (land hectares and emissions released, respectively). Not considering biodiversity loss as a material risk leads businesses to underestimate its impact and scope.

The lack of adequate action extends to even the companies that are considered the most sustainable. Reale et al. (2019: 6) found that only one of the seven companies that were considered the most sustainable under Brazilian market, was able to achieve “conservation actions that mitigate entire of their externalities, and, also, of other companies located in the same area”. It shows that it is possible for a company to realize measures that maintain the ecosystem services utilized in the business processes. However, one of the companies went even as far as stating that biodiversity is irrelevant for their production and stakeholders, although they were also dependent on it. “Considering that these companies were recognized as having

the most sustainable practices of the Brazilian stock exchange, it is questioned how would be the situation of the other companies that do not participate in the ISE portfolio." (Reale et al. 2019: 7) The results suggest that, in general, even the companies that are considered sustainable are not implementing the necessary action to promote ecosystem services in Brazil, which agrees with the assumption that companies are not doing enough.

Limited number of companies establishes biodiversity commitments, but there is suggested action that addresses challenges attributed to it. De Silva et al. (2019) reviewed 66 companies that had no net loss or net positive impact (NNL/NPI) environmental commitments between 2001 and 2016. Exactly 50% of these companies had commitments for biodiversity. However, due to fluctuations in numbers of companies having active commitments (increased and decreased due adoption and retracted or became unclear), in the end they only had 18 companies to analyse who were active with their NNL/NPI biodiversity commitments. This implies the deficiencies in corporate planning and reporting. Additionally, De Silva et al. (2019) found that all of the companies lacked meeting science-based criteria in their biodiversity commitments, only meeting a portion of the 8 criteria (5-7 71%; 3-4 29%). The study addresses the challenges of achieving NNL/NPI biodiversity commitments by suggesting 5 recommendations that aim to mainstream biodiversity concerns into the private sector and corporate decision-making (De Silva et al. 2019). The steps suggested by De Silva et al. (2019: 1492-1493) are: "(1) improve materiality assessment so that true biodiversity risks are revealed, (2) adopt science-based criteria to deepen corporate biodiversity commitments and action, (3) measure biodiversity outcomes of corporate commitments, (4) translate corporate NNL/NPI commitment to support local action for biodiversity, and (5) aim for NPI. To address challenges of establishing biodiversity loss, businesses need to see it more like a material risk, and to approach the issue from scientific perspective.

Measuring impacts and increasing transparency are challenges for corporate reporting. The failure to measure biodiversity impacts is a major limitation in literature studying sustainability reporting (De Grosbois, 2012; Addison et al. 2018; Vörösmarty et al. 2018; De Silva et al. 2019). On the other hand, corporate reporting lacks transparency, and some studies argue that it cannot necessarily be trusted what the

companies say in their sustainability reports because it can vary substantially to what they do (Boiral, 2016; Smith et al. 2018; Vörösmarty et al. 2018; De Silva, et al. 2019). Then again, the problem goes in circles, because to achieve the transparency and reliability, there should be proper measures to measure the impact, to give grounds action, and to hold the businesses accountable for their commitments. In general, the focus of the studies was on companies not in primary production, or in other primary production areas than livestock farming. The lack of animal agricultural companies in these studies can be for various reasons but it shows that it is important to study the attitudes of corporate responsibility and biodiversity commitments of the actors within the sector.

2.7. Law and policies regulating biodiversity commitments

In the Pyramid of CSR, legal obligations come second in the hierarchy, after the economic level. De Silva et al. (2019: 1493) addresses the need for more regulation obligating for NPI/NPL biodiversity commitments because they say that although 'commendable', voluntary commitments "are often inadequately applied, only applied by few companies, and are not applied by all companies in sectors, which have the highest impacts", agriculture being one of those. Regulation could help overcome the issue by biodiversity policies in countries and post-2020 biodiversity targets in businesses (De Silva et al. 2019). In the hierarchy of CSR Pyramid, voluntary action would be considered the top two – ethical and philanthropic. If those levels are not reached, it should be considered whether more regulations should be put into action.

Regulation is the most important driver for biodiversity commitments (Chaudhary et al. 2016; De Silva et al. 2019). This would suggest that policy makers should focus on implementing policies that would legally obligate businesses to be more ambiguous and strategic with their biodiversity commitments. Zinnrebe (2018) investigated biodiversity policy integration in Peru through interviews in several sectors, including Agriculture and Fishery. The study analysed the performance of each sector, by 5-part criteria – inclusion, operationalization, coherence, capacity and weighting. The only criteria where MINAGRI (Ministry for Agriculture and Irrigation) ranked very advanced was inclusion because "MINAGRI not only explains the value of biodiversity, it also specifies the processes that pose threats to biodiversity and

defines the target of reducing deforestation rates by 10%" (Zinnrebe, 2018: 158). However, agriculture and fishery present objectives of preserving biodiversity in parallel with objectives of expansion and intensification which are the causes of biodiversity loss (Zinnrebe, 2018). This implies inadequate planning and action to mitigate their biodiversity loss impacts even when the value of biodiversity is acknowledged.

The European Union (EU) has biodiversity related laws. These include Birds Directive (Directive 2009/147/EC) and Habitats Directive (Council Directive 92/43/EEC). Both of these laws aim at protecting endangered species and their habitats. Thus, preventing biodiversity loss. However, the focus is on direct harm, and regulation of hunting, for example. EU recognizes the impact of agricultural intensification on biodiversity, but that is not specified or regulated in the above-mentioned laws. Chaudhary et al. (2016: 3932) state that "…land use decisions are mostly made at national and subnational level" leaving the countries able to enforce country specific hotspots and most damaging land types. "This in turn can induce the changes in production methods and other measures to control further damage (e.g. by shifting from high to low intensity agriculture or forestry or by protecting ecologically valuable habitats)" (Chaudhary et al. 2016: 3932). Regulations could be used to restrict harmful land conversions, and action that threatens species in danger of extinction.

There are many existing international agreements and policies that drive the decision-making in national levels. For example, UN Sustainable Development Goals (United Nations, 2015) that consist of 17 Goals aiming at "peace and prosperity for people and the planet". Two of these are directly related to protecting marine and terrestrial biodiversity: 14 Life on Water and 15 Life on Land. Additionally, Convention on Biological Diversity (CBD, 2020) has developed Aichi Biodiversity Targets that consists of 20 targets withing 5 categories (Strategic Goal A, B, C, D, and E). The 5 strategic goals are the following: (A) address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society, (B) reduce the direct pressures on biodiversity and promote sustainable use, (C) to improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity, (D) enhance the benefits to all from biodiversity and ecosystem services, and (E)

enhance implementation through participatory planning, knowledge management and capacity building (CBD, 2020).

However, there is a consistent lack of application of these goals in the private sector, as suggested by Smith et al. (2019). Other international agreements for biodiversity conservation identified by Alvarado-Quesada and Weikard (2017) are Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on the Conservation of Migratory Species of Wild Animals (CMS), the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), the Convention on Wetlands, the World Heritage Convention (WHC) and the International Plant Protection Convention (IPPC). The amount of concern for biodiversity is evident from the action suggestions provided by the various international agreements created by organizations. Because many international agreements, and hence, awareness of the importance of biodiversity exist, the lack of action is very concerning.

Enough resources are not focused on reaching critical global biodiversity commitments. CBD (Convention on Biological Diversity) had extensive program with biodiversity related commitments between 2011-2020, which was further developed into the post-2020 biodiversity framework (CBD, 2019). However, the aims set for 2020, were not achieved by 2020. Same happened with IUCN Red Listing's (2020) goal to identify 160 000 species and rank their status by the end of 2020. They fell short in the goal, as in the end of 2020, they had about 128500 species identified. The failure to meet the goals, might be due to insufficient funding or ambiguousness of the action plan. Because of the common interest in the biodiversity loss mitigation, it also distressing to see that the action is not adequate.

2.8. Biodiversity loss in the eyes of stakeholders

Everyone is a stakeholder of biodiversity loss. Because biodiversity is crucial for life on Earth, everyone is involved in the fight against biodiversity loss. Thus, every industry should have the interest to take action as emphasized by Smith et al. (2019). Further, all humans are stakeholders of agriculture – after all, that is how most of the food is produced. Many livelihoods are dependent on animal agriculture (FAO, 2019).

Furthermore, the demand for consumption of meat is increasing (Crenna et al. 2019), and the growth population trend suggest that in the future, more food needs to be produced (FAO, 2019). Still, it remains one of the biggest global issue to which great attention has been drawn to not too long ago.

Reluctancy to act emerges from bias and social norms. Many organizations recommend consumers to eat less meat, e.g. WWF (2017), and CBD (2018). It is considered one of the biggest single actions consumers themselves can take to improve the burden on biodiversity (Stoll-Kleeman and Schmidt, 2017). However, Stoll-Kleeman and Schmidt (2017) explain the reluctancy to do so through cognitive dissonance and sociocultural factors. Additionally, transformation in the primary section, among the food producers, is needed to lead consumers towards more sustainable choices, and to distribute the food produced more evenly to reduce waste (WWF, 2020). Further, reduction of meat from consumer diets does not remove the biodiversity impacts livestock farming has, as long as it is practiced with high volumes.

Throwing the responsibility for other stakeholders, like consumers, does not remove the responsibility that the companies themselves have, nor the impacts they still contribute to the problem. Many organizations like WWF (2017), and CBD (2018) appeal for consumers to eat less meat because of the burden on environment, acknowledging the implication for biodiversity as well. However, all the legislation, or company specific policies do not really speak for this. Considering that meat and dairy have been identified as the most harmful for biodiversity (Crenna et al. 2019), the legislation seems highly limited to restrict the sector. One option could be leveraging so called meat tax. Sewell (n.d.) questions the effectiveness meat tax as it does not help consumers to make the connection with meat being harmful for the environment, or unethical for animal welfare, but rather might make them react with objections and reluctancy towards higher taxes. Instead, Sewell (n.d.), suggests that the subsidies paid for American livestock farmers should be removed, so that the price of the products (meat and dairy) would rise to their actual price level. These subsidies could then be reallocated for healthier, and more sustainable foods, like vegetables. She argues that eliminating agricultural subsidies in the US alone would lift millions of people out of poverty around the world because poorer nations rely on

importing food that locals could produce because of the lower prices enabled by these subsidies. Similar subsidies are also paid in EU to support livestock farmers. The subsidies paid for animal farms contradict with the consensus that meat consumption should be reduced, as they allow animal-based products to be sold in prices that make them have an advantage in the food market.

2.9. Conceptual Framework

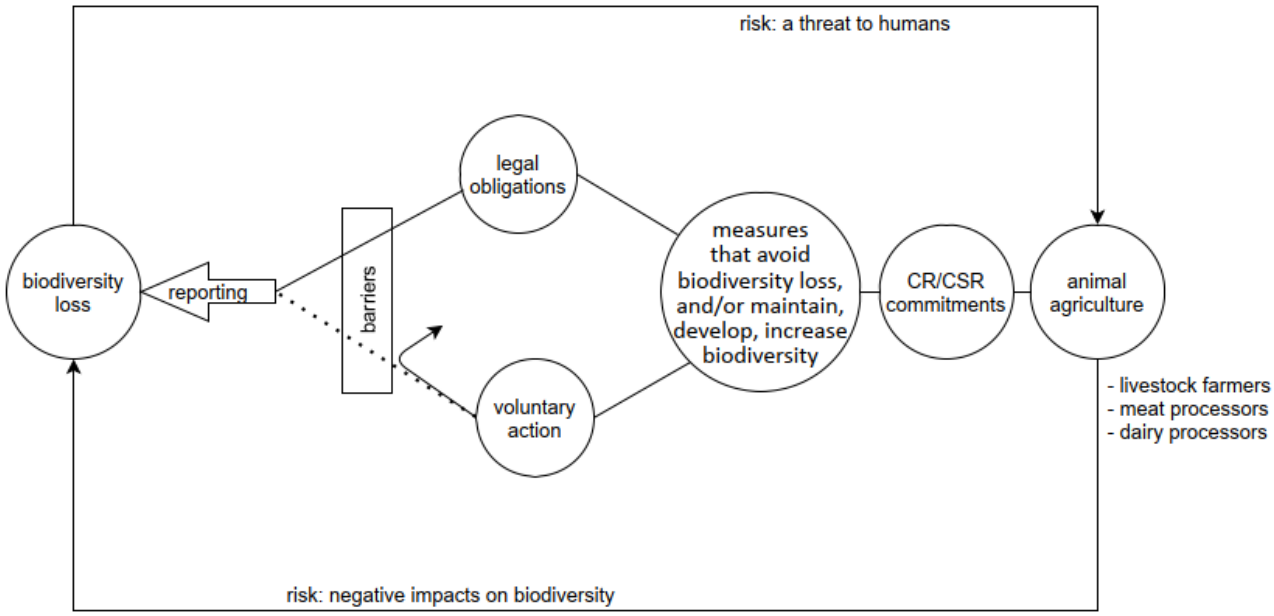

Figure 1. Conceptual Framework

Animal agriculture is a risk for biodiversity loss due to the negative impacts it has, and on the other hand, through risking the living conditions on Earth, biodiversity loss is a risk for animal agriculture. This suggests that businesses should pose biodiversity related CR/CSR commitments. The commitments can be roughly divided to two categories, legal obligations determined by laws, and voluntary action, that businesses can implement to protect biodiversity, in addition to the legal responsibilities. Voluntary action, however, in general, gets caught by barriers which prevent them to be implemented. The barriers could be lack of motivators, such as financial benefits and lack of regulative nature, and lack of measurement tools and existing direction on how to protect biodiversity effectively. Further, the framework presents how the commitments that acted upon can be reported in corporate

reporting and that way be communicated to stakeholders. The successful biodiversity commitments can potentially have positive effect on the global biodiversity loss situation, which also can be communicated in corporate reporting.

2.10. Conclusion

Animal agriculture poses substantial burden on biodiversity due to habitat change (Chaudhary et al. 2019; Rafferty, 2019). The operations use extensive amount of land that is converted for feed growing and pastures mainly. Agricultural intensification leads to habitat changes that causes species extinction. Therefore, agriculture has huge pressure on biodiversity and the risk emerging is a risk for both. Although there are measurement tools to measure biodiversity impacts (Crenna et al. 2019), it is still identified to be problematic to calculate the impacts and the also biodiversity protection action, and whether they outperform each other (De Silva et al. 2019). CSR suggests that in addition to economic and legal aspects of businesses, businesses should be concerned with ethical and philanthropic action as well. In turn, corporate responsibility promotes considering environmental responsibilities equally with economic and socio-cultural responsibilities lifting the value on e.g. biodiversity commitments. Nonetheless, companies tend to not act voluntarily with measures that would be considered adequate. This could be indecisiveness raised by the moral complexity as suggested by De Olde and Valentinov (2019) or it could be caused by the wrong approach, and limitative understanding due to the model used as suggested by Geva (2018), or it could be affected by both. Without proper measures, the future regarding biodiversity seems dark, and therefore it is important to identify gaps in research about biodiversity prevention action.

3. METHODOLOGY

3.1. Summary of methodology

Research methodologies can be divided into two major categories, quantitative and qualitative approaches, which aim to produce quantitative and qualitative data, respectively (Antwi and Hamza, 2015; Ragab and Arisha, 2018). Quantitative research allows for large sample sizes, causal explanations, and generalization of

data, whereas qualitative research can be used to explore complex phenomenon subjectively and in detail (Antwi and Hamza, 2015; Ragab and Arisha, 2018). Both approaches to research methods also have weaknesses. Quantitative methods might produce too abstract data that is hard to apply to specific contexts directly, and it might ignore occurring phenomena because it aims to only test theories (Ragab and Arisha, 2018). On the other hand, qualitative data often cannot be generalized, or used for hypothesis or theory testing, and the collection of data can be very time-consuming, and researcher's own biases can influence results and their interpretation (ibid). Because of the different nature, careful consideration of different possibilities needs to be done in order to choose the most suitable methodology. The two could be also considered complementary and used as mixed method design, where qualitative and quantitative research techniques can be combined to gain richer data and see the consistency of results across methods or explore the insights of the topic further (Ragab and Arisha, 2014).

Some common research techniques are questionnaires, case studies and interviews as discussed by Ragab and Arisha (2018). With quantitative approach, questionnaire is a common technique, and there are many ways and types of questions that can be used to design a questionnaire, but their purpose is descriptive or explanatory (Ragab & Arisha, 2018). Validity, i.e. measuring the intended measures, and reliability, consistent results, are used to evaluate the success of questionnaire design according to them. They argue that case studies can be effectively used with triangulation of sources, and this technique can be altered for both quantitative and qualitative data collection based on the purpose of the research. About the interviews Alsaawi (2014) says that as opposed to questionnaires, they are often used for qualitative data collection since they allow exploring experiences, beliefs, and identities holistically through open-ended questions. Still, closed interview questions can be used to explore quantitative ideas (Doody and Noonan, 2013). Interviews were chosen as the qualitative empirical research method for this study. This was, because the aim of the study was to understand attitudes, opinions, and values in-depth, and the interview was considered effective method for the purpose.

There are several types of interviews to choose from. Doody and Noonan (2013), Alsaawi (2014), and Raghab and Arisha (2018) discusses the following variety:

structured interviews, unstructured interviews, and semi-structured interviews. Structured interviews they define as strictly pre-planned and consistent, but even though they allow for comparison between the interviewees, they lack ability to ask follow-up questions or clarification when needed. They describe unstructured interviews being like open discussions where interviewer's participation is minimal, and instead interviewee can choose the direction and extend of the responses. Semi-structured interviews are a combination of structured and unstructured interviews; they use pre-planned questions, but the questions are open-ended to give room for explanations, and allow probing and rephrasing of questions (Doody & Noonan, 2013; Alsaawi, 2014; Raghab & Arisha, 2018), or even skipping questions (Raghab & Arisha, 2018). Additionally, Alsaawi (2014) describes focus group interviews as one interviewing technique. Focus groups can be organized as structured, semi-structured or unstructured interviews, but they are conducted with group of individuals (6-12) and can generate rich data with variety of perspectives (Alsaawi, 2014). Of these types, semi-structed interviews were chosen as a method because it allowed for certain flexibility and strictness; the planned questions formulate a guide and structure for the interview, but interviewer's additional questions and comments can be used to maintain the focus and gain insights about the topics that are looked at. Because individual representatives were interviewed, the interviews were planned as individual interviews.

Eight semi-structured interviews were conducted in order to collect data. Seven of the interviews were conducted via online videoconferencing (Zoom or Microsoft Teams), and one via email. Mann (2016) lists many different modes for conducting interviews: face-to-face, telephone, video conferencing (Google Hangouts, Skype), a chat room interference, and email. He points out that telephone and Skype interviews are practical and resource efficient, and they resemble face-to-face experience. For this research, videoconferencing was convenient due to resources, accessibility (geographic location) and Covid-19 pandemic which all limited possibility for face-to-face interviews. The pre-decided question sets (see appendices) were used as interview guides. All the questions were asked in the same order, but follow-up questions were asked, and additional clarifications and explanations given where needed in the interviews, expect for the one done via email. Email was used for one of the interviews because it was preferred by the interviewee. Additionally, one of the

interviews were held as a pair interview, making the number of interviewees be altogether nine.

3.2. Data collection

3.2.1. Qualitative interview

All of the 8 interviews were held online: five via Teams, one via Zoom and one via email. The time allocated time for the video interviews was maximum of one hour. The lengths of the interviews varied between 30 to 60 minutes. The interviews were recorded on the platform that was used. Recording was necessary in order to be able to transcribe the interviews accurately, and later use that effectively in the analysis, as suggested by Alsaawi (2014). English and Finnish languages were offered as possible means of communication, but all the interviews were done in Finnish. Recordings were handled with confidentiality. Transcripts were written using Voice Typing function on Microsoft Word, and manually correcting the auto-generated scripts. Anonymity of the companies and the representatives, as well as the experts and their institutions, was promised, and hence, details that could lead to recognizing them are withdrawn from this publication.

One of the interviews was conducted via email. As discussed by Mann (2016), written asynchronous responses (such as email interview) allow the interviewee to reflect on and give coherent responses, but it lacks engagement and richness that can be established in spoken interviews. For the online video interviews, the interview questions were sent to participants a few days prior (2-4 days), in case they wanted to prepare for the interview. However, preparation was not required for participation. A short slide deck (2 content slides) was prepared to explain further UN sustainable development goals and Aichi targets referred to in question 4 for company representatives, and question 5 for experts. This was shown and discussed when the participant wanted to hear more about them. The slides consisted of the respective goals or targets in Finnish. The interview guide also included links for UN SDG's and CBD Aichi targets' websites so that the information on the agreements were easily accessible by the interviewees if they wished to familiarize themselves with them prior the interview.

Overall, the questions were open ended, and reasonings were asked for responses in the interviews. The interview aimed at discovering attitudes, and perceptions of the livestock farmers and the processors in the Finnish context. There were two slightly different questions sets, one for experts and one for the primary producers and the processors. The questions were constructed and structured to reveal and explore ideas and concepts drawn from the literature review and conceptual framework. The questions set can be found from the appendices. The data collected was further processed and the main themes were picked from the transcripts.

3.2.2. Data processing

The recordings were reviewed a few times during the transcribing process, and the final transcripts were read carefully for analysis. In the analysis process, Atlas.ti software was used to code the transcripts. The coding was then used to find relevant themes. Themes were chosen as the approach to analyse the data because, as opposed to analysis by question, it was possible to sum up the themes across the questions. With the semi-structured interviews, sometimes points were illustrated prior or after the respective questions that the answer most related to, and hence, it made more sense to explore the ideas by themes. Themes were chosen based on the literature review, conceptual framework, and the interview questions, and issues raised by the participants. Not all issues discussed in the interviews are necessarily included in the chosen themes. The purpose of the themes was to capture most relevant points for the study.

There are many different approaches to analysis. Ragab and Arisha's (2018) study includes following narratives: thematic analysis, structural analysis, interactional analysis, performative analysis. They describe thematic approach as identifying themes of meaning by exploring the content, structural analysis as exploring the ways language is used to tell a story, interactional analysis as focusing on the flow of dialogue between the interviewer and interviewee, and performative analysis as observing the behavioural characteristics of the dialogue. They also suggest that the boundaries between the different narratives are not well defined. However, thematic approach was chosen because it was considered to support the emphasis of the

analysis – to find patterns and discrepancies in the data. Furthermore, many non-verbal attributes would have been difficult to capture as the interviews were held fully online, so observing the mannerisms of the participants would have been more difficult than perhaps in face-to-face situation. Additionally, one of the interviews was done via email, which would have reduced the comparability of the transcripts across interviews if the focus of would have been on something else than the content.

3.3. Limitations of methodology

Firstly, Alsaawi (2014) points out that interview process is time consuming because many of its steps take time: finding right participants, conducting the interviews, writing transcriptions, and analysing them. The reliability of interviews is low, because interpretations can be highly dependent on the researcher (Alsaawi, 2014), and the interview method allows for only small sample size (Ragab and Arisha, 2018). Thus, the results of semi-structured interview cannot be generalized (Harvey-Jordan & Long, 2001). However, the purpose was to understand ideas and create qualitative discussion, in a particular context. Secondly, the interviewer was not trained. This can cause some researcher and question biases, as there is a risk, for example, for follow-up questions being biased or that analysis is biased because it is done by one person, possibly causing subjective point of view. In general, interviews are prone to different research errors and biases according to Harvey-Jordan and Long (2001). Thirdly, possibility of response bias by interviewees is also a threat; they might alter their responses to be more desirable (Ragib & Arisha, 2018). The sensitivity of the topic was considered and that was why anonymity and confidentiality were ensured for the interviewees. Lastly, the methodology relies on the interviews. One way to add depth, could have been case studies of the companies by exploring their responsibility reports, and other marketing efforts like website, social media, and packaging. In general, to add credibility, using mixed methods design could help overcome some of the limitations. Mixed methods design can help eliminate weaknesses of each of the methods used as suggested by Ragard and Arisha (2014).

4. FINDINGS

4.1. Description of the sample

Purposive sampling was used to acquire company representatives and experts for interviewing. Qualitative studies usually use non-probability sampling methods which include quota, purposive, snowball, self-selection, and convenience methods (Ragab & Arisha, 2018). Purposive sampling was chosen because as Saunders et al. (2009), as cited in Ragab and Arisha (2018: 11), explain that it can be used to select "particularly informative individuals will enable the researcher to meet research objectives", and therefore, it was considered suitable method to acquire people with the desired knowledge and experience for the interviews. The main criterion for company representatives was to find employees of businesses that either are in primary production, i.e. farms, or businesses that process these animal-based primary products further (dairies, or meat processors). The criterion for the experts were specialization in animal agriculture related issues. The other expert was from politics and another from research regarding organic farming.

There were eight interviews, and altogether nine interviewees. Other interviews were individual interviews, but one of the interviews (dairy 3) was conducted as a pair interview; one of the participants was from the processing side, and the other from primary production. This was done by request from the company, so that they would be able to provide information also on the primary production level. It was accepted, because of the close-knit collaboration between the farm and the dairy. The purpose is to look at the questions from different perspectives, and this way also farm perspective was able to be obtained in detail. As mentioned before, one of the interviews (cattle farm) answered the interview via email. Since a copy of the interview was sent via email, and the farm entrepreneur answered it independently, there was no room for follow-up questions. However, for the purpose of the research, their perspective was valuable and therefore, it was good that the interview happened with these arrangements.

All participants belonged to one of the three groups: primary producers, processors, and experts. Two experts, and two farmers were interviewed, as well as 5 representatives from dairies or meat processors. Emphasis on the processors were

chosen, because they form a link between farmers and consumers, as they process the primary products and market those for consumers and other businesses. Potential interviewees/companies were initially contacted either via email or phone. Following table summarizes interviewees.

Interviewee name	**The role/area of expertise**	**Description**
expert 1	politics	agriculture policies
expert 2	research	organic farming
dairy 1	employee	large, also international affairs, own line for organic
dairy 2	chief executive officer	small, uses local milk for the manufacturing of goods
dairy 3	employee and farm entrepreneur	mid-sized, also international affairs
meat representative 1	employee	beef, focus on primary production
meat representative 2	employee	pork mainly, focus on primary production
cattle farm	farm entrepreneur	organic livestock farming

Table 1. Summary of interviewees.

The summary of the interviewees can be seen in Table 1. It shows the name of interviewee used in this publication, the general role or area of expertise the interviewee has in the company or institution they represent, and description that gives a bit more information on the institutions and companies. The size of the dairy companies is described as large, mid-sized, and small to compare the sizes among the three different companies. The products they produce, and sell are variety of dairy products such as milk, butter, cheese, bread cheese, yogurt, pudding, etc. The meat representatives 1 and 2 are from the same meat processor company, which is a relatively large company in Finland, but they give insights from two different perspectives: beef and pork. They were able to provide different insights as the

primary production differs based on the type of meat, and thus, both of them were considered valuable for the research.

4.2. Results

The following themes were drawn from the interviews: (1) importance of biodiversity for the business operations, (2) general attitudes towards biodiversity commitments, (3) actors considered powerful and important in working on more biodiversity inclusive operations, (4) economic benefit as a driver for biodiversity commitments, and (5) application of UN SDGs and/or CBD's Aichi targets. Summary table of the results (Table 2) in the end of this section demonstrates the overview of the results.

Importance of biodiversity for the business operations

All the interviewees indicated the importance of biodiversity for businesses at least indirectly, through the impacts their business operations have, or action they have made. Most business representatives said directly that it is important when answering the question number 2. However, expert 1 did not want to take a stand on behalf of the companies and farmers, and meat representative 1 avoided direct yes or no response. Additionally, many said that it was personally important to them, before stating what they believed the company stand is.

The interviewees identified wide variety of impacts on biodiversity in the animal agriculture sector. Expert 1 talked about animal agriculture having an absolute value because it keeps open living environments open, hence, having a wholesome benefit for the society. Additionally, they pointed out perennial grass cultivation, natural pastures, and manure to have positive impacts. On the other hand, expert 1 was concerned for reduced pasturage in livestock farming. Expert 2 pointed out the benefits of organic farming, where the starting point is already more in line with nature compared to conventional. They talked also about manure and pasturage but also pointed out agro-forestry where crops and pasture are in the same area with trees and shrubs. The expert 2 reviewed the impacts from critical point of view, expressing also negative impacts such as land area used for feed crops, chemical

pesticide usage, and feeding animals with crops that could be used for humans directly, such as cereals and legumes.

Dairy 1 had done mapping on their biodiversity effects, and they pointed out the manure, and pasturage as well. They pointed out the genetic diversity of dairy cows in Finland, the pasturage in areas not suitable for cereal cultivation, caring for traditional biotopes, and using nitrogen-fixing plants instead of fertilizers. Additionally, their mapping included negative impacts such as reduced grazing, and modification of peatlands. Dairy 2 focused their efforts on green energy usage, and reducing environmental burden of packaging material. They said that their operations have nothing that cause biodiversity loss, and that grazing of cows should be increased, although they recognized the peatland conversion being a controversial topic. Dairy 3 pointed out also packaging related issues, as well as farm specific action such us pesticide usage, and protection for birds. Meat representative 1 highlighted their resource strategy for their processes, e.g. by refusing using soy as feed for the beef cattle. They noted that problem areas are monocultures, and over-pasturing. Meat representative 2 on the other hand pointed that although the use of soy had been abandoned from cattle feed, it was still being used for pigs. However, they disclosed that measures to reduce the use had been taken into action. They also identified the plastic reduction as one of the actions they have been able to take. They talked about unilateral barley cultivation for feed, and glyphosates in soy cultivation to be harmful. The cattle farm, on the other hand, highlighted their organic practices, protection of traditional biotopes, eutrophication prevention in the beach, and keeping the living environments open for, e.g. field birds, and having permanent grasslands, which they called as carbon sinks.

General attitudes towards biodiversity commitments

Corporate responsibility issues were considered to some extent self-evident for the companies. Legislation and economic profitability were generally considered the foundation for the operations. The experts hoped that voluntary measures in CSR would be a major driver for companies. The meat representatives highlighted the importance of their values and strategies in decision-making. However, extensively the economic profitability was highlighted to be the starting point.

The attitudes about biodiversity among the farmers and general public were considered problematic, and it was thought that a lot of work should be done to change the attitudes towards biodiversity commitments to be more favourable for the farmers and to be supporeted by consumers. It was also thought that the results from biodiversity commitments should be more concrete because if the results cannot be seen, it is hard to understand what is the benefit of it. In general lack of understanding and lack of knowledge about biodiversity was considered problem. It was thought that there should be more investment in research. One thought was that the farmers might be too stuck with continuing working with traditional systems rather than trying something new.

Overall, it was considered positive to have even just small steps that aim in improvements for biodivesity, rather than trying to make transformational change, and that the change should be approached from positive perspective for the farmers. It was thought by dairy 3 that in the future, biodiversity commitmenst could be a “new normal” meaning that some of the actions that now can be considered competative advantage would become standardized procedures in the future. Although in general, consumers might not be worried or aware of the biodiversity impacts of their dietary choices, there are small consumer groups that loudly express their interest in biodiversity by challenging the businesses to be more responsible from that perspective, and who, for example, support organicly produced animal products over conventional.

Actors considered powerful and important in working on more biodiversity inclusive operations

Many actors were identified to be part of the problems and solutions in animal agriculture. For example, the consumers were identified to be those who the companies want to listen to because they do products for them. Future consumers were also discussed in relation to motivators for biodiversity commitments. The ministry (Ministry of agriculture and forestry in Finland), Finnish Food Authority, Centre for Economic Development, Transport and the Environment, and municipal agriculture advisors were brought up as important actors for setting policies and

advising and educating farmers about them. The government were considered to have role in providing monetary support and investing in research.

Additionally, the whole supply chain was considered to have impact on the companies' biodiversity commitments with varying ability to impact farmers' methods. Auditing in business-to-business sales was considered important way for business partners to monitor biodiversity commitments. Retailers who display the products for end consumers can influence the consumer behaviour, and they were also considered to have power to influence pricing and through that, the profitability of farmers. The dairies' and meat processors' own agriculture advisory services were found to be influential. Collaboration with the farm and the processor, but also with Finnish non-governmental organizations were considered to potentially be more effective ways to find solutions for biodiversity loss prevention than trying to find solutions by oneself. Additionally, sponsors such as banks were mentioned for having a role in supporting the farmers to acquire biodiversity-friendly practices. Finally, media was considered important to raise discussion on provide independent perspectives about biodiversity loss.

Economic benefit as a driver for biodiversity commitments

Economic benefit and consequences were not directly asked as such. The perspective of economic responsibility or profitability along with legal, and voluntary, and on the other hand, environmental and social responsibilities were raised by the interviewer when asking about corporate responsibility (question 6 for companies, and question 5 for organizations). Additionally, interviewees discussed it e.g. with motivators, challenges and competitive advantage. In general, the companies thought that the economic benefit was basis for their action, whereas experts considered that whilst economic benefit will be important, a real concern and personal values might be stronger drivers. Biodiversity commitments were considered to probably add costs for the companies, and hence, they thought that the increased cost should be shared with consumers. Everyone thought that biodiversity commitments can bring competitive advantage for the farmers and other businesses in the food industry.

Application of UN SDGs and/or CBD's Aichi targets

The interviewees were asked whether they applied international agreements such as United Nations' Sustainable Development Goals or Convention on Biological Diversity Aichi Targets in their company. All said they had not planned their operations based on the above-mentioned international agreements, nor did they indicate following any other similar agreements. However, all agreed that they were to at least some extent working towards similar goals regardless as presented in the international agreements. Additionally, experts thought that the international agreements present guidelines for company action too, although they are not legally binding. After all, these agreements were considered useful as they aim for comprehensive sustainability.

The summary table below (Table 2) compares threats and opportunities drawn from the interviews. The table summarizes the content for each of the themes chosen for the analysis.

Theme	Threats	Opportunities
Importance of biodiversity for the business operations	Underestimating or even ignoring the negative impacts. Difficulties of measuring the consequences or the benefits. Especially conventional production methods are challenging because they are based on monocultures and producing high volumes. Concrete threats as recognized by the interviewees are fertilizers, grazing, peatland modification, pesticides, animal feed, over-pasturing, plastics in packaging, and land use.	Realized concern for biodiversity and increased awareness leading to action. Organic farming provides more natural methods for livestock farmers than conventional methods. Concrete opportunities as recognized by the interviewees are traditional biotopes, eutrophication prevention, open ecosystems, protection of field birds, manure, pasturage, possibility to practice agroforestry, ruminants feeding on grass.
General attitudes towards biodiversity commitments	Underestimating the importance of making a large-scale difference. Results are not seen, and abstract concepts are hard to comprehend which leads to lack of knowledge and understanding.	Some consumers are aware of importance of biodiversity and ask for biodiversity commitments. Biodiversity conservation can be standard in the future. Comprehensive application of sustainability provides opportunities for businesses.
Actors considered powerful and important in working on more biodiversity inclusive operations	Underestimating one's own power and thus, shifting too much responsibility for others. Too much power to control prices given to retailers. The other actors not invested in the biodiversity related commitments. Lack of understanding, lack of concern among all the actors.	Cooperation between different actors. Shift in consumer behaviour can change purchasing patterns, authoritative agencies can help planning requirements for conservation action, agriculture advisors can further help farmers change their systems, media can spread awareness.
Economic benefit as a driver for biodiversity commitments	Focusing too much on economic benefit can neglect comprehensive benefit of biodiversity commitments. It can belittle the importance of voluntary measures and allows companies to justify their choice of not going beyond the legal requirements.	Economic benefit can motivate businesses to do biodiversity commitments. It can incentivise continuing development. Increased workload is expected to be compensated and higher profitability can bring that compensation.
Application of UN SDGs and/or CBD's Aichi targets	Underestimating the role of Finland and Finnish companies to commit to international agreements. Taking for granted that all factors considered in the international agreements are realized in the Finnish context when it might not be that simple.	If goals of the agreements are well established in the Finnish context, it can give competitive advantage for Finnish products in the international markets, and influence and others' decision-making. Being an example for applying international agreements.

Table 2. Summary of the interview results.

5. DISCUSSION AND ANALYSIS

5.1. Importance of biodiversity for the business operations

The question to describe the impacts of animal agriculture or the business operations was set to be neutral and not skew towards positive or negative impacts specifically. The point was to see objectively, what the companies point out, and how they approach the issue. The results show that there are many potential ways to protect or improve biodiversity in the farms, and that the impacts have been, to some extent, explored. It can be seen, that the dairy 1, for example, puts more effort in understanding the impacts from the primary production level, than dairy 2. Dairy 2 is little further from the actual farms because they buy the primary products through another dairy. Dairy 1 is a large company meaning that they have more resources to spend on research and expertise on specific issues. They are a bigger player in domestic and international markets meaning that they are also challenged more about biodiversity issues by consumers and B2B sales partners, which they discussed during the interview.

Because some of the company representatives hesitated to answer whether biodiversity loss is important concern for their company on behalf of the company, it can suggest, that internally the companies might not discuss about biodiversity and biodiversity loss, and the meaning to their company directly. This was also addressed by meat representative 2 when talking about external communication with consumers.

> “We have communicated with consumers about issues that relate to biodiversity, such as reduction of soy, reduction of plastic, biogas usage, but not with the word ‘biodiversity’."

The idea of biodiversity being among all other concerns, and that it can be easily overlooked was pointed out by dairy 1 who said that not all companies necessarily consider biodiversity related issues as extensively because they simply have other concerns – and that the same applies to consumers.

What really stood out was that dairy 2 said:

> “I do not see that there is anything in our operations that would cause biodiversity loss except for the mandatory i.e. packaging material related matters”.

Right after they briefly touched upon controversies about peatlands and grass cultivation in livestock farming, but still overlooking the possibility that there could be biodiversity loss related impacts. This can suggest, why they also did not have particular biodiversity commitments, although it was considered as an important topic. On the contrary, diary 1 was very aware of their both positive benefits and negative impacts, because they had bought consultancy on that. The companies, therefore, have very different starting points for biodiversity commitments which can draw implications to their interest and their priorities.

As suggested by De Silva et al. (2019) companies tend to lack systematic and science-based criteria for biodiversity commitments. Their suggested action includes improving materiality assessments, adopting science-based criteria, measuring the outcomes of action, using NNL or NPI to support local biodiversity action and aiming at NPI. However, the interviews revealed that businesses are concerned about lack of research, lack of measurement tools, and lack of understanding of biodiversity commitments in corporate level. Smith et al. (2019) found that biodiversity commitments often lack quantifiable outcome information. As suggested by dairy 1, it is hard to find accessible measurement tools, and as discussed by dairy 3 and meat representative 2, biodiversity loss is such an abstract term, that it might be challenging to materialize the impacts of business operations or the impacts of the biodiversity commitments.

5.2. General attitudes towards biodiversity commitments

The attitudes towards biodiversity commitments in corporate responsibility were considered important and for example dairy 2 argued, that if the company acted poorly in any aspect of corporate responsibility, it would be damaging for the whole business. This is also highlighted in study by Gold and Heikkinen (2013) as they argue that all different dimensions (economic, socio-cultural, and environmental) are important in corporate responsibility. The minimum legal responsibility was discussed, and both experts thought that the corporate responsibility could be stricter by law although it would be hard to implement. Additionally, dairy 1 noted that political decisions, and laws, have a possibility of increasing the minimum of business

action towards biodiversity, and meat representative 1 pointed out that when preparing the laws, it would be important to collaborate with the businesses like the Ministry of Finland has done previously. In general, the companies' perspective was that they should be incentivized for taking further actions, e.g. by higher prices, or legal measures. For example, Le Coent et al. (2017) and De Silva et al. (2019) found financial and legal obligations, respectively, to be important motivators for biodiversity commitments. This idea of regulations and policies being more powerful motivator than voluntary action really highlights the attitude of CSR seen as the Pyramid of CSR with hierarchical order rather than intersecting circles where the ethical and philanthropic action would be considered as a strategic part of the company planning.

Attitudes, understanding and knowledge were concerns for almost all interviewees. Especially for dairy 3; both the dairy representative and the farm entrepreneur discussed how there should be shift in attitude among the farmers, and that the knowledge should be passed on for others in a way that is not aggressive, and will not generate overwhelming stress. Meat representative 1 and dairy 3 discussed that farmers might be stuck with the methods they have used previously. Cattle farm considered one of the challenges for biodiversity commitments to be own and employees' wellbeing because the environmentally friendly practices generate more work for them. One of the issues that might be causing lack of understanding, and knowledge and on the other hand, reluctant attitudes, can be the abstractness and hardship of measuring the biodiversity impacts and seeing the biodiversity loss.

From the processors, all considered that the small things they are doing, and small improvements they project coming in future, will suffice. However, similarly, some of them lacked direct biodiversity commitments, and some voiced the difficulty of measuring biodiversity, which is also addressed by literature. This suggests that it is not easy to tell whether the company actually does enough as also suggested by De Silva et al. (2019). Expert 2 brought up that animal agriculture cannot be sustained at the current levels in the long term. From the businesses, only meat representative 1 discussed that it might not be easy to combine eating animal-based products (meat in their case) with biodiversity related values. Weight was on little, realistic actions, but concern for transformational change, or potential of alternative farming, was not further brought up in any of the interviews. This is controversial, because Smith et al.

(2019) highlighted the importance to make ‘fundamental system level change’ in relation to biodiversity loss, and the need for large-scale change in food systems as addressed in the Living Planet Report 2020 (WWF, 2020).

Still, generally the understanding of own ability to act was considered high. The cattle farm considered themselves as ‘a major conservationist’. The dairy 1 expressed that they have authentic ability to improve biodiversity, and be an example for other businesses, and dairy 2, although frustrated about their own small size admitted that as a business, they have better starting point to act than single consumers, and meat representative 1 highlighted the importance of biodiversity for their operations by saying, without it, they would not be able to have the animals their business relies on.

5.3. Actors considered powerful and important in working on more biodiversity inclusive operations

Multiple different actors were identified in all of the interviews. It really illustrates that there are so many factors and players to consider in food supply chains in animal agriculture. However, it also illustrates how the responsibility is shifted away from the company for someone else, although these companies are able to, in varying degrees, impact also the members of their own supply chain. It is important for the companies to recognize that they are not alone, and it is important to the other actors to realize their role. Collaboration can be significant opportunity to find wholesome solutions to the biodiversity loss related problems from the concrete action to influencing the attitudes of the public as discussed. Then, others can also help, too. Media can be a major player when distributing knowledge and raising awareness, also presenting objective perspectives. Because so many other actors also have a role in establishing and supporting biodiversity commitments, it can be easy to wait for others to take action, although it would be critical to everyone share the responsibility and work together for an established common goal.

Consumers can reduce the biodiversity loss contribution of their diets by reducing the consumption of meat and other animal-based products like dairy (Stoll-Kleeman & Schmidt, 2017; Crenna et al. 2019). Yet, when looking at the Finnish context, the consumption of meat decreased for the first time, and only by 1.8%, from 2018 to

2019, according to Natural Resource Institute Finland's Balance Sheet for Food Commodities (Luke, 2020). On the other hand, Finnish milk consumption has continuously decreased in recent years, whereas other dairy product consumptions have stayed the same or declined only slightly (Luke, 2020). Therefore, some dietary changes can be seen when looking at the statistics. Still, the current consumption and way of producing meat cannot sustained in the long-term. Expert 2 also noted in the interview, that all Finnish meat and dairy producers are not in very good position regarding profitability right now. That could be one barrier to hinder farmers to make decisions on allocating time and money resources to biodiversity conservation. However, as expert 2 pondered, reduced consumption would lead to lower production volumes which could potentially allow the production of meat and dairy be of higher quality, and more sustainably produced.

5.4. Economic benefit as a driver for biodiversity commitments

Everyone agreed that economic benefit from biodiversity commitments would be favourable. Especially the businesses thought that it is the foundation for any such activities. The farmers, as any other businesses need to get the costs covered and generate returns to be profitable. The experts pointed out that regular consumers are not in general ready to pay higher prices, but the company representatives and farmers voiced that higher prices are expected for products that considerably differ from the competitors. Integrated pest controls and fuel savings can even lower the costs, but in case biodiversity measures would mean higher costs, committing to biodiversity commitments was not considered realistic by meat representative 2.

Cost structure was discussed to be problematic, as both experts said that only a niche group of consumers is ready to pay more for the products. Expert 2 added: "But I would not rely on consumers solely to rapidly slow down the biodiversity loss", and that the rapid change needed would require involvement of wide variety of actors in the society. Dairy 3 discussed that younger generations are more concerned for the environment, and therefore want to buy more natural foods for their families. Most companies said, in one way or another, that they would expect higher prices for taking nature more into account. The cattle farm and dairy 3 thought that the higher

profits would be justified because they work for the common good, and it creates more work on their side as well. According to dairy 1, dividing the cost has not been discussed broadly enough, although one approach to it has been seen in the organic production where producers need to do more work to follow the methods that are then more biodiversity-friendly, and the consumer pays somewhat higher price for it.

5.5. Application of UN SDGs and/or CBD's Aichi targets

From the two sets of international agreements, UN SDGs and Aichi targets, UN SDGs were more known by the interviewees. UN SDGs are a comprehensive list of different goals diverging from climate and biodiversity to equality and poverty related issues, for example, whereas Aichi targets are specifically biodiversity related. The fact that SDGs were considerably more known, suggests that the idea of climate change is more widespread than focus on biodiversity and that perhaps projects to also consumers and other actors, and their knowledge and attitudes. None of the companies applied these directly, but many considered that they at least partially worked alongside them. The experts thought that it could be beneficial for companies to be familiar with them, and work towards similar goals.

Meat representative 2 identified their operations aiming at Aichi Strategic Goal B: "Reduce the direct pressures on biodiversity and promote sustainable use" (CBD, 2020) even though the actions are not planned based on these Aichi targets. On the other hand, dairy 2 and 3 considered that all Finnish companies meet these goals, although the particular goals were not very familiar for them from before. Dairy 1 also thought that their activities aim at similar goals, but since the targets are so broad in nature, they felt that they could not state if all the goals are actually met.

Although the aim of the interview was to study the Finnish context, the animal agriculture sector has impacts and implications from local to global level as well. This was discussed in relation to feed production, international trade, and competition in the grocery store. Whether the Finnish farmers continue to support businesses abroad that grow e.g. soy in the rainforests or not was perceived to make a difference. The cattle do not feed on soya at all, and the proportion of soy in pig feed was aimed at reduced levels in the meat processor. Large global companies were

identified to be very interested in also the biodiversity commitments of their trade associates. Although biodiversity commitments were thought to have competitive advantage, it was discussed that the competition in the market is unfair because the starting point of corporate responsibility is different compared to Finnish products and other countries' products, and that the consumers might not be aware of all the issues behind that.

5.6. Limitations

One of the biggest limitations of the results is the sensitivity of the topic. Although dairy 1 discussed that other sectors (e.g. forestry) are challenged more for their biodiversity issues, livestock farming also gets criticism for environmental and animal welfare related questions, for example, as discussed by dairy 3. However, dairy 2 thought that bigger dairies would probably get challenged about biodiversity related issues daily. Overall, the animal agriculture, especially its industrialization, has implications for biodiversity loss. Therefore, the issue of biodiversity can be considered somewhat sensitive, and this can have impacted some of the answers. Desirability bias (Ragib & Arisha, 2018) could have influenced the answers if the participants anticipated specific answers or ways of presenting their answers more favourable in the light of the topic and give a better image of their companies. The choice of anonymity was made in the methodology planning stage. It was decided that any names are not identified in the publication so that it would incentivise honest answers, and that there would be no concern to have impacts of the reputations of the representatives' companies.

6. CONCLUSIONS

6.1. Main Findings

This research aimed to explore the role of animal agriculture as an industry on impacting the development of biodiversity, and to understand how livestock farmers and animal-product processors should take action to minimize or even reverse their contribution to biodiversity loss. Wake up call to realize the importance of biodiversity has been relatively recent. Clearly, there are many ways animal agricultural

businesses are able to take biodiversity better in account. Motivators like legal obligations, monetary incentives, better profitability, ability to work for more sustainable world were identified, but also challenges, like lack of knowledge, awareness and attention, problematic attitudes, and increased costs. Research, cooperation and open discussion were considered effective for finding more approachable measurement tools for biodiversity commitments, as well as to concretize the concept of biodiversity loss and the effectiveness of biodiversity commitments for not only farmers and other businesses but also the general public.

Although the interviews demonstrated great deal of feelings of importance towards biodiversity, the actions taken to conserve biodiversity varied greatly. One of the companies said they had ordered a custom research to map out their biodiversity impacts. This company (dairy 1) also demonstrated greater strategic action to battle biodiversity related issues among other environmental issues compared to the other processors interviewed. Other environmental concerns, like climate change, often overshadows the biodiversity action and therefore companies' environmental efforts tend to focus on carbon neutrality and climate change, rather than biodiversity loss. Number of other actors, in addition to primary producers, processors, and experts interviewed have role in biodiversity loss, which makes it difficult to outline each one's responsibilities. However, since biodiversity loss is considered to be less concrete, research on biodiversity measurement tools should be made, to help mainstreaming the importance of biodiversity and to talk about it in ways that would be easier to approach by companies, consumers and other stakeholders.

6.2. Implications for International Business

Although the Finnish context was investigated under this study, animal agriculture is practiced globally, and hence, the questions are relevant globally and in other local contexts, too. In Finland the trend of reducing meat is somewhat visible (Luke, 2020), but globally, the demand for meat is projected to continue to increase. This is because developing countries where meat has been luxury item can afford meat better, and because the global population trend is expected to grow (Kashmanian, 2019). Additionally, Finnish businesses' view on biodiversity impacts international business in terms of international trade. For example, some of the feed is bought

from abroad, and some of the products are exported abroad as discussed in the interviews. Boycotting e.g. soy will have an impact on the soy crop farmers. As told by the dairies 1 and 2, in international affairs, the international large companies are auditing their business partners' actions for biodiversity more than the domestic business partners. Additionally, other EU countries belong under same decisions, and support systems decided on at the EU level. In the common market the Finnish products compete not only against other Finnish products but also imported products, as well as exported products compete against those countries' domestic products.

To consider even broader picture of the implications for international business, biodiversity is important for other global problems. Biodiversity has implications for example for global warming and Covid-19 pandemic, because more versatile ecosystems are more resilient for changes (Isbell et al. 2015). Because of that, the discussion of biodiversity conservation cannot be left out from other important global problems. That is also why biodiversity loss will have great impact globally, and to many other sectors and businesses in addition to animal agriculture and food production systems.

6.3. Suggestions for Further Research

There are many ways that research could further investigate issues raised in this paper. For example, market research could be done to understand the consumers attitudes and perceptions towards biodiversity and biodiversity loss, and whether they consider their dietary changes have impact on a larger scale. The market research could also investigate whether consumers would be ready to pay higher prices for products that mitigate biodiversity impacts. There could be research on strategies that could be utilized to communicate importance of biodiversity for primary producers, consumers, and other supply chain members. To provide more in-depth understanding of companies' biodiversity related actions, case-studies of companies could be made, especially about those who already strategically take biodiversity into account in their planning, to spread knowledge of the existing ways to develop biodiversity. The possibility to make legal obligations stricter corporate responsibility laws regarding biodiversity could be searched to find ways that raise the bar of company level action.

From biological perspective, it would be important to focus on finding measurement tools and evidence for effective and efficient action. Another option could be investigating plant-based foods compared to animal-based ones from the biodiversity perspective. This could draw attention and raise awareness of the impact consumer choices have. To some extent environmental issues have been investigated but focus on biodiversity is generally minimal. On a larger scale, transformational potential of traditional farming could also be researched; whether alternative methods of producing meat or dairy, or whether changing the production trend could be better in terms of biodiversity and businesses' profitability. Finally, other regions could be investigated to find similarities and differences in attitudes between countries and to find common ground for further action.

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APPENDICES

Interview guides. All the interviews were conducted in Finnish, but here are English translations for the guiding questions. Careful consideration of the translations was made to avoid possible translation errors.

APPENDIX A: Question set for the organizations

The participation in this interview is voluntary and withdrawal at any given time is possible without reasoning and without consequences. You may decline to answer any particular question/questions that you do not wish to answer. This interview will be recorded, and the answers will be kept confidential. Your privacy will be secured. Interviewee and the organization being represented will stay anonymous in all publications of the research.

1. How does your organization influence biodiversity related issues?
2. What activities that affect biodiversity does your organization identify from animal agriculture?
3. How can businesses in animal agriculture promote biodiversity conservation in their operations?
4. How can your organization influence companies' biodiversity targets and their implementation?
5. Should businesses apply international targets such as the UN Sustainable Development Goals (”UN SDGs”) or Convention on Biological Diversity’s Aichi Targets (”Aichi Targets”)?
6. How do you think that CSR, i.e. corporate social responsibility, should take biodiversity into account?
7. What motivates or could motivate businesses in animal agriculture to commit to biodiversity commitments?
8. What challenges or obstacles do you see that animal agriculture has in preventing biodiversity loss and achieving biodiversity commitments?
9. Do consumers expect businesses to have concrete action related to biodiversity loss?

10. How could communication between consumers and businesses be further developed when discussing biodiversity related issues?

11. How do you think that companies should act now and, in the future, to protect biodiversity?

12. Do you think that conserving biodiversity is important and relevant concern for animal agriculture?

APPENDIX B: Question set for the businesses

The participation in this interview is voluntary and withdrawal at any given time is possible without reasoning and without consequences. You may decline to answer any particular question/questions that you do not wish to answer. The interview will be recorded, and the answers will be kept confidential. Your privacy will be secured. Interviewee and the company being represented will stay anonymous in all publications of the research.

1. What activities that impact biodiversity have you identified in your operations?

2. Do you think that conserving biodiversity is important and relevant concern for your business?

3. Do you currently have any biodiversity related activities or targets? What?

4. Do you apply international agreements such as the UN Sustainable Development Goals (”UN SDGs”) or Convention on Biological Diversity’s Aichi Targets (”Aichi Targets”) in your company?

5. How do you think that CSR, i.e. corporate social responsibility, should take biodiversity into consideration?

6. What motivates or could motivate you to set goals to promote biodiversity conservation?

7. What challenges or obstacles do you see in preventing biodiversity loss and achieving biodiversity targets?

8. How do you think about your own effectiveness in promoting biodiversity conservation within your supply chain?

9. What do you think, are your customers and / or end consumers concerned of the biodiversity impacts of your operations?

10. Have you communicated biodiversity related issues to customers? If you have, how do you communicate the issues with them?

11. Do you consider that protecting biodiversity is a competitive advantage for you
    a. now?
    b. in the future?

12. What resources do you have now and in the future to take action to prevent biodiversity loss?